

12040

SERIES

SERVICE MANUAL

The 2040 Dual Disk System Service Kit will provide the Service Center means to isolate defective components or subassemblies by way of utilizing the internal diagnostics of the 2040, program diagnostics and trouble-shooting guides included on diskette and cassette.

Some of the procedures are redundant but each procedure performs different operations even though it seems to be the same procedure;

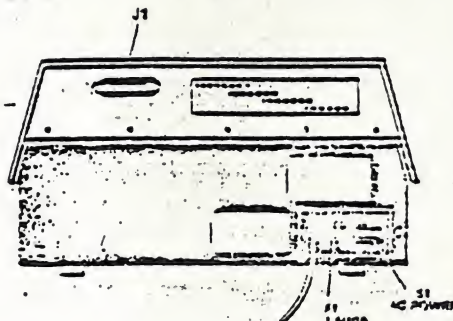
The service procedures have been broken into categories to enable you to do an overall check or test a particular area of the 2040 system. The procedure relating to the SA 390 drive exercises all areas including alignment capability. Alignment procedures have been deleted due to necessary special tools and training. Commodore will provide this training in designated locations and times. You will be notified of schedule.

We have also included in the 2040 Service Kit, a price list for SA 400.



1. Position the computer and 2040 near one another in an open work area.

2. Locate the power switch on each machine and place the rocker switch in the OFF position (the white dot on the switch not visible).



3.0 Plug the power cord into an AC outlet. Power on the 2040 System without connecting to the 2001. Check the three (3) LEDs located on the front panel. (fig. 1) They should turn on momentarily. If all the LEDs do not extinguish then a problem has developed in the system. The diagram below indicates possible location of the defective component.

<u>LEDs</u>	<u>Possible Defective Component</u>
• • •	6532's, 6530, 6504
o • •	6332 at L1
• • o	6332 at H1

fig. 1

4.0 Power 2040 System OFF before replacing any components. After changing components and problems still exist, replace Digital Logic assembly.

5.0 Connect a PET to IEEE cable between the systems.

6.0 Apply power to the 2001 and note the power on message. Power on the 2040, the LEDs on the front panel should light momentarily.

7.0 Before you start testing the 2040 system, it's a good idea to load the PET DOS SUPPORT program into the 2001. The program is designed for easier accessibility to the commands of the 2040 system. See Appendix B for detail description of the use of PET DOS SUPPORT.

7.1 To load a program from mini-diskette:

7.1.1 Place the "2040 System Test" diskette in drive 0 of the 2040 system and close the door.

TYPE

LOAD"\*,8 [RETURN]

Drive 0 on the 2040 system will initialize the diskette and load the first program on the diskette. Note the error LED on the front panel of the 2040. If an error occurs then some problem occurred. Power OFF the 2001 system then back on. Repeat this step. Be sure to remove diskette before turning power OFF.

7.1.2 If you are unsuccessful the second time to load the program from drive 0, try to load the program from drive 1. The procedure is as follows:

1. Insert 2040 Test mini-diskette into drive 1.
2. TYPE

OPEN 1,8,15,"I1" [RETURN]

1. This will initialize the mini-diskette on drive

3. When the cursor returns to the screen

TYPE

LOAD"1: PET\*,8 [RETURN]

The program should now load in the 2001. If the error light turns on, you have isolated the defect to the Digital Logic or analog assembly. By trying to load the program from both drives eliminated drive failure. Proceed to step 7.2 for loading procedures from cassette tape.

4. TYPE

RUN [RETURN]

The screen will now display PET DOS SUPPORT. See Appendix B for detail description of the use of PET DOS SUPPORT.



5. To load the first test program use the following procedure:

TYPE

↑ LOG\* [RETURN]

The Logic Diagnostic program will be called from storage on the mini-diskette and be loaded into the 2001.

6. Proceed to 8.0 for operating instructions of the Logic Diagnostic test.

7.2 To load a program from cassette tape.

7.2.1 Connect the C2N unit to the tape interface connector on the 2001 or use the internal cassette unit.

7.2.2 Place the 2040 SYSTEM TEST/C tape in the cassette and rewind the tape.

7.2.3 Load the first program on the tape by depressing the "SHIFT" key and "RUN/STOP" key simultaneously. When the program finishes loading, the 2001 will display PET DOS SUPPORT program. See appendix B for detail description of the use of PET DOS SUPPORT.

7.2.4 Load the Logic Diagnostic program from cassette tape by depressing the "SHIFT" key and "RUN/STOP" key simultaneously.

The 2001 will display:

SEARCHING  
FOUND LOGIC DIAGNOSTIC  
LOADING

7.2.5 The Logic Diagnostic program will load from cassette tape and execute. The entire loading process should take approximately one minute.

8.0 LOGIC DIAGNOSTIC TEST

8.1 Follow the instructions that appear on the display of the 2001. If the logic components on the Digital board are in working order, the front panel LEDs will randomly blink. If a problem has been detected a slow distinct pattern will be present. Reference the chart on the screen of the 2001 to isolate defective component.

## FAIL STATES OF DIAGNOSTICS

STATE	COMPONENTS-POSITION
• • •	6532-- E1, C1
• • o	6332-- K1
• o •	6332 - H1
• o o	2114 - C4 to F4 C5 to F5
o • •	6532 - E1, C1, Connector P1
o • o	6530 - K3 6504 - E3
o o •	6530 - K3

When the program detects an error condition, it will loop on the address where the error has occurred. The select line on the chip will toggle at a steady rate. In the case of a RAM failure, the select line will toggle the 1K blocks. Note, the block with the error condition and replace one of the two RAMs in the block.

8.2 If you are unable to isolate the failure replace the digital logic board.

8.3 Turn power off before replacing any components on the 2040 system.

8.4 Power the 2040 system back on.  
LOADING



8.5 Depress "RUN/STOP" key on the 2001, then depress the "SHIFT" key and "CLEAR HOME" key simultaneously. The 2001 display will now be blank.

8.6 To restart the "LOGIC DIAGNOSTIC" program:

TYPE

RUN [RETURN]

8.7 When the program has been run for 15 minutes and no failures have occurred you can assume the Digital Logic board is O.K.

9.0 "READ/WRITE" TEST:

The Read/Write test allows you to verify the Read/Write heads of the drive. Gross alignment errors and the analog board are also checked.

9.1 Load the READ/WRITE test program from:

a) mini-diskette

or

b) cassette

9.1.1 FROM MINI-DISKETTE

TYPE

↑READ\* [RETURN]

NOTE: Be sure to initialize drive before trying to load a program.

9.2 FROM CASSETTE TAPE

TYPE

LOAD "READ/WRITE" [RETURN]

When the cursor returns to the screen:

TYPE

RUN [RETURN]

The 2001 screen will instruct you to:

9.3 Insert formatted mini-diskettes labeled "A" in both drives and close the drive doors.

NOTE: You may create an "A" mini-diskette by formatting a blank mini-diskette on a known good 2040 system.

9.4 The first part of this program initializes both drives and checks the stepper motors. Answer the question yes or no. If the answer is yes the program will continue to the next check. If the answer is no a malfunction has been detected. Possible failures are Drive Unit, Analog Assembly, Bad Media, or 6522.

To verify a drive failure, connect a good drive unit in place of the suspected drive. You do not have to remove the drive in question. Set the good drive on top of the suspected drive and connect it to the appropriate connectors. This procedure allows you to verify the drive without disassembly of the 2040.

9.5 The second part of the program actually reads a sector on each track. The left side of the display shows two numbers, 0 and 1. These are the drive numbers. The graph displays tracks that have been tested. A black square or squares indicates one of the following devices is bad. Replace in order.

1. Bad Media
2. Bad Analog
3. Bad Drive

NOTE: Remember to turn power off and remove diskettes before changing assemblies.



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TYPE

RUN [RETURN]

NOTE: Special tools and training are necessary for Head Alignment and Carriage Limiter Adjustment. DO NOT proceed with these two adjustments unless you have been factory trained.

the screen of the 2001 to isolate defective component.

val and ex-change.



9.6 To complete the "Read/Write" program, the screen will ask you to repeat the test or to format the mini-diskette. The formatting of the mini-diskette is the last procedure of the test.

Upon completion of this test you will have checked the validity of the Digital Logic assembly, Analog assembly and parts of the drives. You should be able to load programs from mini-diskettes at this time. If not, repeat previous tests or consult Commodore Customer Service.

## 10.0 2040 TEST/ADJUST

The "Test/Adjust" program was designed to allow the user to test the function of the 390 Drives for correct operation. The program also contains the software to allow a trained user to align the SA 390 drives in the 2040 system. The program is menu oriented which allows the user to test specific functions of the Drive or to run the chain of tests to insure proper operation. Reference Appendix A for detailed explanation of each section.

10.1 Load the "Test/Adjust" program from mini-diskette by inserting the 2040 Test Diskette into Drive 0.

TYPE

↑2040 TEST\* [RETURN]

NOTE: Be sure to initialize the drive before attempting to load the program.

10.2 The "Test/Adjust" program is now displaying the first menu. For simplicity the program has been broken down into categories.

### Procedure 1

SA 390 Test and Checkout is a step by step procedure through all the different tests performed on the disks;

### Procedure 2

SA 390 Adjustment and Alignment. This procedure will allow you to do all mechanical adjustments pertaining to the drive.

NOTE: Special tools and training are necessary for Head Alignment and Carriage Limiter Adjustment. DO NOT proceed with these two adjustments unless you have been factory trained.



Procedure 3

2040 Drive Compatibility. This procedure will allow you to check the alignment compatibility between the drives. It will format a mini-diskette on one drive and attempt to read it on the other.

Procedure 4

SA 390 Test Menu. Allows the user to individually select a test for all known problems without running through all the tests. After the selected test is completed it is a good idea to do a complete test.

Procedure 5

SA 390 Adjustment Menu. Allows the user to do the individual adjustments without going through all the adjustment procedures.

NOTE: Special tools and training are needed for Head Alignment and Carriage Limiter adjustment. DO NOT proceed with these two adjustments unless you have been authorized by the factory.

## 11.0 FINAL SYSTEM TEST

The Final System Test performs an overall test of the system. This test is divided into two parts, First part being file handling, read and write to and from different tracks, and exercises the 390 drives. Second part checks for soft errors, (soft errors are errors that are corrected by firmware). This procedure will detect all soft errors and will print out on the screen how many soft errors have accrued for each track of the diskette

11.1 Insert the 2040 SYSTEM TEST Diskette into Drive 0 and initialize the diskette.

11.2 TYPE

↑FI\* [RETURN]

11.3 You will be instructed to insert the two formatted "A" diskettes and press RETURN

11.4 The program will first execute a new command on Drive 0 then on Drive 1 to check the mechanical movement of the drives. After the mechanical test the program will go thru a sequence of reads and writes.

11.5 If the test fails, note the failure and return to the appropriate test procedure for finding the defective component. Continue to the next part of the test by pressing the "C" key

11.6 The screen will inform you to insert the 2040 SYSTEM TEST diskette into drive 0 and press RETURN

11.7 The program will now load the diagnostic code to check for soft errors. Asterisks will be written across the screen during the loading of the machine code.

11.8 Remove the 2040 SYSTEM TEST diskette and insert the "S" diskettes in both drives. Press RETURN when ready.

11.9 The "S" diskettes contain a worst case pattern that covers the entire diskette. This part of the program attempts to read the entire diskette without obtaining a soft error. If a soft error occurs, the quantity of the soft errors and the track number on which they occur will be printed on the screen. Two complete passes of each drive is necessary to complete the test.

11.10 If an error has occurred restart the test by pressing the "R" key and noting the error on the second pass. If the error still occurs verify that all modifications have been done on the 2040 SYSTEM and the head alignment is correct.

11.11 After the completion of all the tests the 2040 SYSTEM has been exercised to the known limits of the software.



## APPENDIX

- A       ADJUSTMENT PROCEDURE
- B       PET IOS SUPPORT
- C       COMPONENT CROSS REFERENCE
- D       SA 390 PARTS REFERENCE

PROCEDURES

ADJUSTMENT

B

APPENDIX



## A.0 HEAD STEPPER TEST

This test insures free operation and correct motion of the head carriage and stepper motor. The test first moves the head out to track 0 and then it moves the head in to track 34. The final portion of the test moves the head in and out between track 34 and track 0. If the drive does not respond as outlined above, there are two probable causes.

1. Bad stepper motor (replace the drive).
2. Improper stepper control (check stepper control circuits. Possible bad 6522).

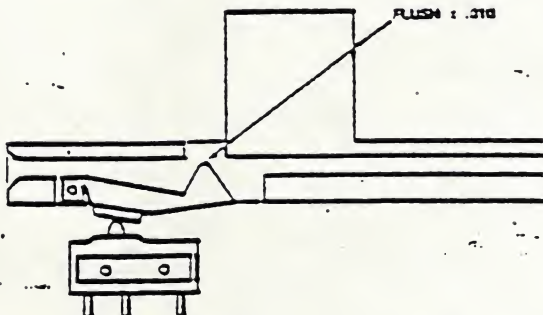
## A.1 LED TEST

This test checks the LED on the drive specified. The tests are on, off, and blinking. If the LED does not respond properly then skip (use yes responses) to the blink portion and check the signals to the LED. Possible failures are:

1. Signal to LED (replace the drive).
2. No signal to LED (could be the analog board, cables or the 6532 (E1) replace the faulty part).

## A.2 WRITE PROTECT SWITCH TEST

This test allows the user to check the function of the write protect switch on the disk drive. The drive's LED will be on for protected and off for not protected.



Failure of this test can be caused by the following:

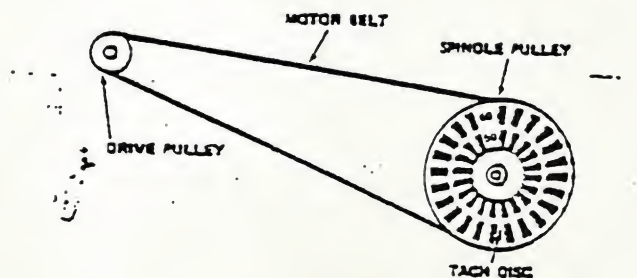
1. Bad switch (replace drive).
2. Improperly adjusted switch.
3. Bad electronics (check 6530 UK3).

### A.3 MOTOR SPEED ADJUSTMENT

Motor Test - will check motor operation and speed calibration. Adjust the motor speed pot with small flat blade screw driver until proper strobe pattern is stationary. Adjusting pot clockwise will move strobe counter-clockwise.

7. Turn the pot R-12 located on the motor control PCB until the dark lines on the spindle pulley appear motionless. For 60 HZ use the outside ring of lines. For the 50 HZ observe the inside ring. Reference Figure 4.

NOTE: This adjustment can be made only in an area where there is fluorescent lighting.



### A.4 MOTOR SPEED TEST

This test checks the speed of the spindle motor to insure it is within tolerance. If the drive fails this test it should be replaced or if possible, realigned.

### A.5 HEAD ALIGNMENT

NOTE: This adjustment is not normally required even on head replacement due to the pre-aligned head and carriage assembly, but if the stepper motor mounting screws are accidentally loosened, if parts damage has occurred or you are experiencing interchange problems use the following procedure to check and adjust the head alignment.

Remove and adjust drive 0 first. The drive may be removed by extracting the four (4) phillips screws from the bottom of the 2040 system and by removing the head and edge connectors from the analog board.



Once drive 0 is adjusted, replace drive 1 with it. The analog board can be removed from drive 1 by removing the connectors and extracting the two (2) phillips screws securing it in place. The analog board will slide off its mounts. Remove drive 1 by extracting the four (4) phillips screws holding the drive in place and sliding the drive out through the front panel.

Take a piece of cardboard (approximately 5" x 15" size) and lay it across the analog board extending to the right edge of the 2040 system. Locate the drive under test on the cardboard and connect the head and edge connectors to the analog. Place the drive in a horizontal position (on its left side). Now you are ready to adjust the drive.




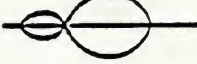
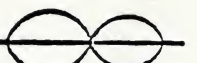
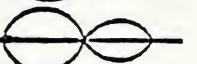

Use a dual trace scope and adjust the scope as follows:

Mode:	Add
Sweep:	20 MS
Volts/Div.:	50 MV
Probes:	3-X1
Trigger:	External

Connect channel 1 probe to TP4, channel 2 probe to TP3, on the analog. NOTE ANALOG PARTS LOCATION FOR LOCATION. Connect trigger probe to pin 9 on position UMS of the digital board. Adjust the trigger level during the head alignment for a lobe pattern on the display.

Head alignment check with the scope should be performed in a horizontal position. Adjustments may be made from underneath or the drive may be put in a vertical position, then returned to a horizontal position for the check. Adjust stepper motor by loosening two clamp screws and slightly twisting the motor in the desired direction. Tighten with torque driver (#10). The initial head alignment should be made for maximum output and equal lobe sizes on scope display.

If either "hysteresis checks" result in unequal lobe sizes, then adjust to split the difference between the two lobes. If this occurs, repeat the alignment check to assure that all positions result in appropriate lobe patterns. Appropriate patterns are lobes which are within 80% in size of each other. Note diagrams.

	Even amplitude (100%) on track
	Left 80% of right + 1 mil off track toward TK0
	Left 60% of right + 2 mil off track toward TK0
	Left 40% of right + 3 mil off track toward TK0
	Right 80% of left - 1 mil off track toward 34
	Right 60% of left - 2 mil off track toward 34
	Right 40% of left - 3 mil off track toward 34

#### A.6 HEAD ALIGNMENT CHECK

This test is simply a validate of the system test diskette.

This diskette has a file that encompasses the entire disk. If any errors occur then there may be an alignment problem. Either replace the drive or align it.

NOTE: Insure your diskette is in good condition before using this test.

#### A.7 WRITE PROTECT SWITCH ADJUST

Use write protect adjustment tool or diskette to adjust write-protect switch. Drive LED will detect protected--LED on and unprotected--LED off.

1. Loosen write protect switch screws and slightly tighten pivot screw (closest to spindle).
2. Insert tool until "shim stock" notch is even with opening in top of disk guide.
3. Raise switch with hex driver until switch closes (watch drive LED).
4. Tighten screws with torque driver (#11).
5. Push tool in all the way until it bottoms against the Platen stop (this will now line up the unprotect slot).
6. Remove write protect tool.
7. Close door.



APPENDIX

B

PET DOS  
SUPPORT PROGRAM

The purpose of this program is to aid the PET 2001 User in operating the 2040 Dual Floppy Disk System. This instruction sheet has been written with the assumption that the reader has a working knowledge of the PET 2001 and the 2040.

NOTE: This program has been placed in the public domain. Please refer all comments and suggestions to the Editor.

The normal method with which the PET communicates with an IEEE Buss device is by the BASIC commands OPEN, PRINT, GET, INPUT and CLOSE. These statements are somewhat verbose in nature and therefore more prone to operator error. There is also the limitation that INPUT and GET cannot be used in direct mode due to shared buffer areas. These isiosyncrasies create a strained 2001/USER/2040 interface which has been greatly improved with the WEDGE 3.1 program.

WEDGE 3.1 may be loaded (saved) as if it were a normal BASIC program. Note should be made of the fact that the 2040 has a special load file name '\*' which if used immediatly after power up (reset) executes the following:

1. Initalizes Drive 0
2. Loads the first file on that drive

Thus if the command LOAD"\*,8 is executed and the WEDGE program is the first directory entry it will be loaded. When the WEDGE rogram is executed it relocates itself up into the highest available RAM memory locations, links into the CHRGET routine and adjusts BASIC's top of memory pointer down. This technique uses about 350 bytes of the Users memory but normal machine operations may proceed without having to reload the WEDGE program until such time that a system reset is performed.

The WEDGE program functions by capturing the data that the PET operating system passes to BASIC, before the interpreter has a chance to parse it. Thus we can look for the escape characters and process the command without the use or knowledge of the BASIC interpreter.

There are four escape characters that are recognized by the WEDGE program. They will be processed only when they are found in column one of an input line, otherwise a SYNTAX ERROR will occur.

#### ESCAPE CHARACTERS

- > - Passes commands to the Disk.
- / - LOAD's a program.
- + - LOAD's and RUN's a program.

The greater than symbol when used preceeding a 2040 Disk command, passes that command directly to the floppy disk system. See the following examples.



```

Thus:
>10
is the same as:
PRINT#15,"10"
and:
>$Ø:FILE1
is equal to:
PRINT#15,"$Ø:FILE1"

```

As you can see the > symbol is a substitute for the PRINT#15 statement. Remember that an OPEN statement is required before a PRINT may be executed but no OPEN is required for the WEDGE.

The second function of the > escape character is the directory list command. As you know the directory of a minidisk can be loaded with a LOAD"\$Ø",8. This LOAD will destroy any program you might have in memory. To avoid the destruction of the current program the WEDGE prints the directory on the screen.

```
>$Ø
```

Means - Display the entire directory of Drive Ø

```
>$1:Q*
```

Means - Display the directory entries of all files on Drive 1 that have names starting with the letter Q.

The third function of the > escape character is the error channel interrogation feature. The error channel is read by typing a > followed immediately by a RETURN. This is equivalent to the following program segment.

```

10 OPEN 15,8,15
20 INPUT#15,ER,MSG$,DRV,SEC
30 ?ER","MSG$","DRV","SEC

```

The LOAD / and LOAD-RUN + escape characters operate the same as their BASIC counterparts only with a simplified syntax as follows,

```
/WUMPUS
```

- The above command will load the program file WUMPUS. Both drives will be searched if required.

```
+1:COPY DISK FILES
```

- This command will load the program COPY DISK FILES from Drive 1 (if it is there) and execute it.

The following requirements and limitations are placed on the WEDGE program user.

1. The WEDGE commands may only be used in direct mode.
2. Programs using GET or INPUT should disable the WEDGE by a POKE 1022,123 statement. This may also be done by typing the > followed by a K and a RETURN.
3. The WEDGE is restored by a POKE1022,08.
4. You may also disable the WEDGE by typing >K.

NOTE: For Users that have a business keyboard PET (CBM) the at key " " may be used in place of the > . This eliminates shifting for the escape character.



```

'S2153
PRINT"J"TAB(11)"_____ "
20 PRINTTAB(11)"J PET DOS SUPPORT "
30 PRINTTAB(14)"NOW LOADED
40 PRINTTAB(9)"  COMMANDS FOLLOWING"
50 PRINTTAB(7)"A > OR @  IN COLUMN 1 WILL"
60 PRINTTAB(9)"BE PASSED TO THE DISK."
90 PRINTTAB(7)"CMD      DESCRIPTION"
140 PRINTTAB(7)"$      DIRECTORY BOTH DRIVES
150 PRINTTAB(7)"$0     DIRECTORY DRIVE 0
160 PRINTTAB(7)"$1     DIRECTORY DRIVE 1"
180 PRINTTAB(7)"  ALL 2040 COMMANDS MAY BE
190 PRINTTAB(7)"ENTERED AS IF THEY WERE IN
200 PRINTTAB(7)"A PRINT# STATEMENT.
220 PRINTTAB(11)"NSPECIAL COMMANDS
230 PRINTTAB(7)"N/     LOAD A PROGRAM
240 PRINTTAB(7)"↑      RUN A PROGRAM
250 PRINT"  SPECIAL COMMANDS START IN COL 1 AND
260 PRINT"ARE FOLLOWED BY A 2040 FILENAME.
270 NEW
EADY.

```

LINE #	LOC	CODE	LINE
02	0000		*****
03	0000		;
0004	0000		;
0005	0000		;
0006	0000		;
0007	0000		;
0008	0000		;
0009	0000		;
0010	0000		;
0011	0000		;
0012	0000		;
0013	0000		;
0014	0000		;
0015	0000		;
0016	0000		;
0017	0000		;
0018	0000		;
0019	0000		;
0020	0000		;
0021	0000		;
0022	0000		;
0023	0000		;
0024	0000		;
0025	0000		;
0026	0000		;
0027	0000		;
0028	0000		;
0029	0000		;
0030	0000		;
0031	0000		;
0032	0000		;
0033	0000		;
0034	0000		;
0035	0000		;
0036	0000		;
0037	0000		;
0038	0000		;
0039	0000		;
0040	0000		;
0041	0000		;
0042	0000		;



LINE #	LOC.	CODE	LINE
14	0000		;PET ROUTINES USED
15	0000		LINPRT = \$DCD9 ;PRINT LINE #
0046	0000		SPMSG = \$F315 ;SEND A MESSAGE
0047	0000		LD15 = \$F322 ;LOAD ROUTINE
0048	0000		TWAIT = \$F8E6 ;WAIT FOR STOP KEY
0049	0000		CHRGET = \$0070 ;INPUTS CHARACTERS
0050	0000		CHRGOT = \$0076 ;GET LAST CHAR
0051	0000		NEWSTT = \$C6C4 ;NEW STATEMENT EXEC
0052	0000		PRT = \$E3D8 ;PRINT A CHARACTER
0053	0000		LISTN = \$F0BA ;SEND LISTEN
0054	0000		SECND = \$F128 ;SEND SA
0055	0000		CIOUT = \$F16F ;SEND CHARACTER
0056	0000		UNLSN = \$F183 ;UN LISTEN
0057	0000		ACPTR = \$F18C ;GET A CHARCATER
0058	0000		TALK = \$F0B6 ;SEND TALK
0059	0000		OPENI = \$F466 ;OPEN FILE
0060	0000		CLSEI = \$F6F0 ;CLOSE FILE
0061	0000		MAIN = \$C392 ;REENTER BASIC
0062	0000		RUNC = \$C572 ;CLEAR VARIABLES
0063	0000		LNKPRG = \$C442 ;LINK BASIC LINES
0064	0000		UNTLK = \$F17F ;UN TALK

LINE # LOC	CODE	LINE
0066 0000		;WEDGE IN ROUTINE WITH THE
0067 0000		;COMMAND PARSER AND EXECUTION
0068 0000		*=50700
0069 0700		;
0070 0700 EA	CMD	NOP ;THROWN AWAY
0071 0701 E6 77		INC TXTPTR ;BUMP POINTER
0072 0703 D0 02		BNE WG100
0073 0705 E6 78		INC TXTPTR+1
0074 0707 AD FE 03	WG100	LDA DEVADR ;WEDGE IN ?
0075 070A 30 3F		BMI WG997 ;NO ....
0076 070C A5 77		LDA TXTPTR ;FIRST COLUMN
0077 070E D0 3B		BNE WG997 ;GET OUT NOT FIRST CHR
0078 0710 A5 78		LDA TXTPTR+1
0079 0712 C9 02		CMP #>BUF ;IN BUFFER?
0080 0714 D0 35		BNE WG997
0081 0716	;	
0082 0716 A0 00	WG110	LDY #500 ;.Y IS BUF INDEX
0083 0718 8C FF 03		STY FLAG ;FLAG SET FOR DIR
0084 071B B1 77		LDA (TXTPTR),Y
0085 071D C9 3E		CMP #'> ;COMMAND PROMPT?
0086 071F F0 12		BEQ WG115 ;YES...
0087 0721 C9 40		CMP #'@ ;BUSINESS KEYBOARD PROMPT
0088 0723 F0 0E		BEQ WG115 ;YES...
0089 0725 C8		INY
0090 0726 8D FF 03		STA FLAG ;SET FLAG FOR LOAD
0091 0729 C9 2F		CMP #'/' ;LOAD PROMPT
0092 072B F0 6D		BEQ DODIR
0093 072D C9 5E		CMP #94 ;CHECK FOR ARROW
0094 072F F0 69		BEQ DODIR
0095 0731 D0 1B		BNE WG997
0096 0733 C8	WG115	INY
0097 0734 B1 77		LDA (TXTPTR),Y
0098 0736 F0 3B		BEQ RDERR ;READ ERROR CHANNEL
0099 0738 C9 24		CMP #'\$ ;DIRECTORY?
0100 073A F0 5E		BEQ DODIR ;YES
0101 073C C9 4B		CMP #'K ;KILL THE WEDGE
0102 073E D0 0E		BNE NOTDIR
0103 0740 A9 80		LDA #80 ;KILL THE WEDGE
0104 0742 4D FE 03		EOR DEVADR
0105 0745 8D FE 03		STA DEVADR
0106 0748 C8		INY
0107 0749 84 77		STY TXTPTR
0108 074B 4C 76 00	WG997	JMP CHRGOT



LINE #	LOC	CODE	LINE
0	074E		;
1	074E		; SEND COMMAND TO DISK
0112	074E		;
0113	074E	AD FE 03	NOTDIR LDA DEVADR ;GET DEVICE ADDRESS
0114	0751	85 D4	STA FA
0115	0753	A9 6F	LDA #\$6F ;SECONDARY ADDRESS 15
0116	0755	85 D3	STA SA
0117	0757	20 BA F0	JSR LISTN
0118	075A	A5 D3	LDA SA
0119	075C	20 28 F1	JSR SECND ;SEND SECONDARY ADDR
0120	075F	E6 77	BUMP INC TXTPTR
0121	0761	A0 00	LDY #\$00 ;INDEX=0
0122	0763	B1 77	LDA (TXTPTR),Y ;GET THE FIRST CHARACTER
0123	0765	F0 06	BEQ WG120 ;ZERO IS LAST CHAR
0124	0767	20 6F F1	JSR CIOUT ;SEND THE CHAR
0125	076A	B8	CLV
0126	076B	50 F2	BVC BUMP ;MORE
0127	076D		;
0128	076D	20 83 F1	WG120 JSR UNLSN ;UN LISTEN
0129	0770	B8	CLV
0130	0771	50 24	BVC WG998
0131	0773		;
0132	0773		; READ THE ERROR CHANNEL
0133	0773		;
34	0773	84 77	RDERR STY TXTPTR ;FIX POINTER
35	0775	AD FE 03	LDA DEVADR ;SET FA
36	0778	85 D4	STA FA
0137	077A	20 B6 F0	JSR TALK
0138	077D	A9 6F	LDA #\$6F ;COMMAND CHANNEL SA
0139	077F	85 D3	STA SA
0140	0781	20 28 F1	JSR SECND ;SEND SA
0141	0784	20 8C F1	WG140 JSR ACPTR ;GET BYTE FROM DISK
0142	0787	C9 0D	CMP #CR
0143	0789	F0 06	BEQ WG130
0144	078B	20 D8 E3	JSR PRT ;PRINT BYTE TO SCREEN
0145	078E	B8	CLV
0146	078F	50 F3	BVC WG140 ;LOOP FOR MORE
0147	0791	20 D8 E3	WG130 JSR PRT ;PRINT CR
0148	0794	20 7F F1	JSR UNTLK ;UN TALK
0149	0797	4C 76 00	WG998 JMP CHRGOT ;DONE WITH CMD

LINE	CODE	LOC	VE #
1	079A		
0. 2	079A		
0153	079A		
0154	079A	C8	
0155	079B	B1 77	
0156	079D	D0 FB	
0157	079F	84 77	
0158	07A1	88	
0159	07A2	84 D1	
0160	07A4	A9 01	
0161	07A6	85 DA	
0162	07A8	A9 02	
0163	07AA	85 DB	
0164	07AC	AD FE 03	
0165	07AF	85 D4	
0166	07B1	AD FF 03	
0167	07B4	D0 79	
0168	07B6	A9 60	
0169	07B8	85 D3	
0170	07BA	20 66 F4	
0171	07BD	20 B6 F0	
0172	07C0	A5 D3	
0173	07C2	20 28 F1	
0174	07C5	A9 00	
75	07C7	85 96	
6	07C9	A0 03	
0. 77	07CB		
0178	07CB	8C FF 03	
0179	07CE	20 8C F1	
0180	07D1	48	
0181	07D2	A4 96	
0182	07D4	D0 4D	
0183	07D6	20 8C F1	
0184	07D9	A4 96	
0185	07DB	D0 46	
0186	07DD	AA	
0187	07DE	68	
0188	07DF	AC FF 03	
0189	07E2	88	
0190	07E3	D0 E6	
0191	07E5	8D FF 03	
0192	07E8	8A	
0193	07E9	AE FF 03	
0194	07EC	20 D9 DC	
0195	07EF	A9 20	
0196	07F1	20 D8 E3	
0197	07F4	20 8C F1	
0198	07F7	A6 96	
0199	07F9	D0 29	
0200	07FB	C9 00	
01	07FD	F0 1A	
02	07FF	20 D8 E3	
0203	0802	AD 12 E8	
0204	0805	C9 EF	
0205	0807	F0 1B	

LINE	CODE	LOC	VE #
3			
3	PRINT THE DIRECTORY		
3			
DODIR	INY		
	LDA (TXTPTR),Y		
	BNE DODIR		
	STY TXTPTR.		
	DEY		
	STY FNLEN		
	LDA #<BUF+1		
	STA FNADR		
	LDA #>BUF		
	STA FNADR+1		
	LDA DEVADR		
	STA FA		
	LDA FLAG		
	BNE LOAD		
	LDA #60		
	STA SA		
	JSR OPENI		
	JSR TALK		
	LDA SA		
	JSR SECND		
	LDA #500		
	STA SATUS		
	LDY #503		
3			
WG220	STY FLAG		
	JSR ACPTR		
	PHA		
	LDY SATUS		
	BNE WG235		
	JSR ACPTR		
	LDY SATUS		
	BNE WG235		
	TAX		
	PLA		
	LDY FLAG		
	DEY		
	BNE WG220		
	STA FLAG		
	TXA		
	LDX FLAG		
	JSR LINPRT		
	LDA #'		
	JSR PRT		
	LDX SATUS		
	BNE WG230		
	CMP #500		
	BEQ WG240		
	JSR PRT		
	LDA PIAK		
	CMP #5EF		
	BEQ WG230		



NE	#	LOC	CODE	LINE		
06	0809	20	E4 FF		JSR \$FFE4	;GET A CHAR FROM KEYBOARD
0207	080C	F0 E6			BEQ WG250	;NOTHING...
0208	080E	C9 20			CMP #\$20	;SPACE BAR?
0209	0810	D0 E2			BNE WG250	;NO...
0210	0812	20 E4 FF	WG255		JSR \$FFE4	;ANY KEY STARTS
0211	0815	F0 FB			BEQ WG255	
0212	0817	D0 DB			BNE WG250	; (JMP)
0213	0819	A9 0D	WG240		LDA #CR	
0214	081B	20 D3 E3			JSR PRT	
0215	081E	A0 02			LDY #\$02	; DO TWICE
0216	0820	B8			CLV	
0217	0821	50 A8			BVC WG220	
0218	0823	68	WG235		PLA	;CLEAN UP
0219	0824	20 F0 F6	WG230		JSR CLSEI	;CLOSE FILE
0220	0827	A9 0D			LDA #CR	;PRINT A RETURN
0221	0829	20 D8 E3			JSR PRT	
0222	082C	4C 76 00	WG999		JMP CHRGOT	;RETURN TO BASIC

LINE	LOC	CODE	LINE
0224	082F		;
0225	082F		; LOAD A FILE
0226	082F	A9 00	LOAD LDA #500
0227	0831	S5 96	STA SATUS ;CLEAR STATUS.
0228	0833	S5 9D	STA VERCK ;LOAD NOT VERIFY
0229	0835	20 22 F3	JSR LD15 ;LOAD A PROGRAM
0230	0838	20 E6 F8	JSR TWAIT ;STOP KEY
0231	083B	A5 96	LDA SATUS
0232	083D	29 10	AND #SPERR ;CHECK STATUS (EQI OK)
0233	083F	D0 EE	BNE LOAD
0234	0841	A0 AE	LDY #MS19-MS1 ;SAY READY
0235	0843	20 15 F3	JSR SPM3G ;PRINT A MESSAGE
0236	0846	A5 CA	LDA EAH ;SET BASIC'S POINTERS
0237	0848	S5 2B	STA VARTAB+1
0238	084A	A5 C9	LDA EAL
0239	084C	S5 2A	STA VARTAB
0240	084E	20 72 C5	JSR RUNC ;FIX POINTERS
0241	0851	20 42 C4	JSR LNKPRG ;FIX LINKS
0242	0854	AD FF 03	LDA FLAG ;CHECK FOR LOAD OR RUN
0243	0857	C9 2F	CMP #' / ;LOAD ?
0244	0859	D0 03	BNE WG300 ;NO...
0245	085B	4C 92 C3	JMP MAIN ;LOAD RETURN TO BASIC
0246	085E	A9 00	WG300 LDA #500 ;SET TXTPTR FOR RUN
0247	0860	A0 04	LDY #504
0248	0862	S5 77	STA TXTPTR
0249	0864	S4 78	STY TXTPTR+1
0250	0866	4C C4 C6	JMP NEWSTT ;RUN PROGRAM
0251	0869		CMDEND



LINE	#	LOC	CODE	LINE
53	0869			
54	0869			
0255	0869			
0256	0869			
0257	0869			
0258	0869	A5 34	POKE LDA MEMSIZ	; POKE TOP DOWN
0259	0868	18	CLC	; MINUS ONE
0260	086C	E9 69	SBC #<CMDLN	
0261	086E	35 34	STA MEMSIZ	
0262	0870	A5 35	LDA MEMSIZ+1	
0263	0872	E9 01	SBC #>CMDLN	
0264	0874	35 35	STA MEMSIZ+1	
0265	0876			
0266	0876			
0267	0876			
0268	0876	A0 01	MOVE LDY #\$01	; SET UP FROM ADDR
0269	0878	A9 00	LDA #<CMD	
0270	087A	35 C7	STA SAL	
0271	087C	A9 07	LDA #>CMD	
0272	087E	35 C8	STA SAH	
0273	0880	A5 34	LDA MEMSIZ	; SET UP TO ADDR
0274	0882	35 5C	STA GRBTOP	
0275	0884	A5 35	LDA MEMSIZ+1	
0276	0886	35 5D	STA GRBTOP+1	
0277	0888	B1 C7	MOV1 LDA (SAL),Y	; RELOCATE
0278	088A	91 5C	STA (GRBTOP),Y	
0279	088C	C8	INY	
0280	088D	D0 F9	BNE MOV1	
0281	088F	E6 5D	INC GRBTOP+1	
0282	0891	E6 C3	INC SAH	
0283	0893	A5 C3	LDA SAH	
0284	0895	C9 08	CMP #>CMDEND	
0285	0897	F0 02	BEQ MOV2	
0286	0899	B0 04	BCS WEDGE	
0287	089B	A0 00	MOV2 LDY #\$00	
0288	089D	F0 E9	BEQ MOV1	
0289	089F			
0290	089F			
0291	089F			
0292	089F	A9 4C	WEDGE LDA #\$4C	; JUMP INSTRUCTION
0293	08A1	35 70	STA CHRGET	
0294	08A3	A4 34	LDY MEMSIZ	
0295	08A5	A6 35	LDX MEMSIZ+1	
0296	08A7	C8	INY	
0297	08A8	D0 01	BNE WEDGE1	
0298	08AA	ES	INX	
0299	08AB	34 71	WEDGE1 STY CHRGET+1	
0300	08AD	36 72	STX CHRGET+2	
0301	08AF	A9 08	LDA #\$08	; DEFAULT ADDR
0302	08B1	3D FE 03	STA DEVADR	
0303	08B4	60	RTS	
0304	08B5		.END	

ERRORS = 0000

# SYMBOL TABLE

SYMBOL VALUE

CPTR	F18C	BUF	0200	BUMP	075F	CHRGCT	0070
ARGOT	0076	CICUT	F16F	CLSEI	F6F0	CMD	0700
ADEND	0869	CMDLN	0169	CR	000D	DEVADR	03FE
DODIR	079A	EAH	00CA	EAL	00C9	FA	00D4
FLAG	03FF	FNADR	00DA	FNLEN	00D1	GRBTOP	005C
LDIS	F322	LINPRT	DCD9	LISTN	FOBA	LNKPRG	C442
LOAD	082F	MAIN	C392	MEMSIZ	0034	MOV1	0888
MOV2	089B	MOVE	0876	MS1	F000	MS19	FOAE
NEWSTT	C6C4	NOTDIR	074E	OPENI	F466	PIAK	E812
POKE	0869	PRT	E3D8	RDEPR	0773	RUNC	C572
SA	00D3	SAH	00C8	SAL	00C7	SATUS	0096
SECD	F128	SPEPR	0010	SPMSG	F315	TALK	FOB6
TWAIT	F9E6	TXTPTR	0077	UNLSN	F183	UNTLK	F17F
VARTAB	002A	VERCK	009D	WED5E	089F	WEDGET	08AB
W6100	0707	W6110	0716	W6115	0733	W6120	076D
W6130	0791	W6140	0784	W6220	07C8	W6230	0824
W6235	0823	W6240	0819	W6250	07F4	W6255	0812
W6300	085E	W6997	074B	W6998	0797	W6999	082C

END OF ASSEMBLY



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PC, IRQ SR AC XR YR SP  
0401 E62E 32 04 5E 00 F3

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0700 EA E6 77 D0 02 E6 78 AD
0708 FE 03 30 3F A5 77 D0 3B
: 0710 A5 78 C9 02 D0 35 A0 00
: 0718 8C FF 03 B1 77 C9 3E F0
: 0720 12 C9 40 F0 0E C8 3D FF
: 0728 03 C9 2F F0 6D C9 5E F0
: 0730 69 D0 18 C8 B1 77 F0 3B
: 0738 C9 24 F0 5E C9 4B D0 0E
: 0740 A9 00 4D FE 03 8D FE 03
: 0748 C8 04 77 4C 76 00 AD FE
: 0750 03 85 D4 A9 6F 85 D3 20
: 0758 BA F0 A5 D3 20 28 F1 E6
: 0760 77 A0 00 B1 77 F0 06 20
: 0768 6F F1 B8 50 F2 20 83 F1
: 0770 B8 50 24 84 77 AD FE 03
: 0778 85 D4 20 B6 F0 A9 6F 85
: 0780 D3 20 28 F1 20 8C F1 C9
: 0788 0D F0 06 20 D8 E3 B8 50
: 0790 F3 20 D8 E3 20 7F F1 4C
: 0798 76 00 C8 B1 77 D0 FB 84
: 07A0 77 88 84 D1 A9 01 85 DA
: 07A8 A9 02 85 DB AD FE 03 85
: 07B0 D4 AD FF 03 D0 79 A9 60
: 07B8 85 D3 20 66 F4 20 B6 F0
07C0 A5 D3 20 28 F1 A9 00 85
07C8 96 A0 03 8C FF 03 20 8C
07D0 F1 48 A4 96 D0 46 AA 63 AC
: 07D8 F1 A4 96 D0 46 AA 63 AC
: 07E0 FF 03 88 D0 E6 8D FF 03
: 07E8 8A AE FF 03 20 D9 DC A9
: 07F0 20 20 D8 E3 20 8C F1 A6
: 07F8 96 D0 29 C9 00 F0 1A 20
: 0800 D8 E3 AD 12 E8 C9 EF F0
: 0808 1B 20 E4 FF F0 E6 C9 20
: 0810 D0 E2 20 E4 FF F0 FB D0
: 0818 DB A9 0D 20 D8 E3 A0 02
: 0820 B8 50 A8 68 20 F0 F6 A9
: 0828 0D 20 D8 E3 4C 76 00 A9
: 0830 00 85 96 85 9D 20 22 F3
: 0838 20 E6 F8 A5 96 29 10 D0
: 0840 EE A0 AE 20 15 F3 A5 0A
: 0848 85 2B A5 C9 65 2A 20 72
: 0850 C5 20 42 C4 AD FF 03 C9
: 0858 2F D0 03 4C 92 C3 A9 00
: 0860 A0 04 85 77 84 78 4C C4
: 0868 C6 A5 34 18 E9 69 85 34
: 0870 A5 35 E9 01 85 35 A0 01
: 0878 A9 00 85 C7 A9 07 85 C8
: 0880 A5 34 85 5C A5 35 85 5D
: 0888 B1 C7 91 5C C8 D0 F9 E6
: 0890 5D E6 C8 A5 C8 C9 08 F0
: 0898 02 B0 04 A0 00 F0 E9 A9
: 08A0 4C 85 70 A4 34 A6 35 C8
: 08A8 D0 01 E8 84 71 86 72 A9
: 08B0 08 8D FE 03 60 AA AA AA
: 08B8 AA AA AA AA AA AA AA AA

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APPENDIX

C

COMPONENT  
CROSS REFERENCE



# 2040 Digital Logic Assembly Parts Cross Reference

<u>REF. DES.</u>	<u>DESCRIPTION</u>	<u>PART#</u>	<u>DEALER PRICE</u>
C-1-C6, C8-C18, C21 C23-C29	.1 MF 50V	900020-01	.23
C31, C33, C35-C46	.1 MF 50V	900020-01	.23
C7	100 PF 50V	900010-17	.05
C19, C22	10 MF 20V	900402-09	.48
C20	.01MF 50V	900010-38	.05
C30, C32	10 MF 25V	900100-01	.10
C34	47 MF 16V5	900100-33	.33
CR1-CR6	1N5402	900753-01	.28
CR7-CR9	1N4001	900750-01	.11
P1	IEEE Conn. Right Angle	903206-01	5.85
P2	Header, .1 Spacing, 20 Pin	9033H-01	1.60
P3	Header, .156 Spacing, 5 Pin	903302-02	.13
P4	Header, .156 Spacing, 3 Pin	903302-13	.09
P4	Header, .156 Spacing, 6 Pin	903302-06	.14
P5	Header, .1 Spacing, 2 Pin	903307-12	.08
R1, R2, R12-R14	470 ohm, 1/4 W 5%	901550-58	.05
R3, R4	5.1 K ohms 1/4 W, 5%	901550-03	.05
R5, R6	2.4 K ohms 1/4 W, 5%	901550-85	.05
R7, R15, R16	2 K ohms, 1/4 W, 5%	901550-53	.05
R8	10 K ohms, 1/4 W, 5%	901550-20	.05
R9	100 K ohms, 1/4 W, 5%	901550-07	.05
UA1, UE6, UL2	74 LS 04	901521-02	.34
UA3, UB3	74 LS 42	901521-17	.85
UA4	7414	901522-19	.95
UA6	74 04	901525-01	.45
UB1, UB2, UD2	MC 3446	901524-01	2.47
UB4, UH6, UJ2	74 LS 00	901521-01	.32
UB6, UC6, UD6	74 LS 193	901521-26	1.15
UC1, UE1	6532 PIA	901458-01	10.50
UC3, UD3, UE3, UF3	74 LS 157	901521-11	.75
UJ5, UK5, UL5	74 LS 157	901521-11	.75
UC4, UD4, UE4, UF4	6114 RAM	901453-02	12.00
UC5, UD5, UE5, UF5	6114 RAM	901453-02	12.00
UF6, UH2	74 LS 02	901521-21	.48
UH1	6332-21, ROM	901468-07	20.00
UH3	6504 MPU	901455-01	10.00
UH5	74190	901522-16	1.18
UJ6, UN2	7406	901522-06	.36
UK3	6530 PIA	901466-02	14.00
UK6	6316 ROM	901467-01	20.00
UL1	6332-20 ROM	901468-06	20.00
UM2	LM555	901523-01	.45
UM3	6522 VIA	901437-01	12.00
UM5	74 LS 133	901521-15	.85
JM6, UN6	74 LS 165	901521-12	1.55
UN1	6502 MPU	901435-01	11.25

<u>REF. DES.</u>	<u>DESCRIPTION</u>	<u>PART #</u>	<u>PRICE</u>
UN5, UP5	74 LS 164	901521-28	1.23
VR1, VR2	7812 +12V 1.5A REG	901528-04	2.25
VR3	LM 323 +5 3A REG	901528-01	7.00
Y1	16 MHZ Crystal	900557-01	1.40
	28 PIN I.C. Socket	904150-05	.50
	24 PIN I.C. Socket	904150-04	.35
	40 PIN I.C. Socket	904150-06	.60



# 2040 Analog Assembly Parts Reference

<u>REF. NUMBER</u>	<u>DESCRIPTION</u>	<u>PART NUMBERS</u>	<u>DEALER PRICE</u>
C1,C2	4.7NF 25V Elect.	900101-07	\$ .16
C3,C4,C10,C11,C14	.1MF 50V Cerm	900020-01	.23
C5,C15	300PF 500V Mica	900050-16	.45
C6,C7	750PF 300V Mica	900050-15	.83
C8	.033MF 50V Cerm	900020-03	.54
C9	10MF 20V Tant	900402-09	.48
C12	4700PF 200V Mica	900050-17	.53
C13	1.6MF 15V Tant	900105-01	1.20
C16	680PF 300V Mica	900050-01	.79
C17,C18	.01MF 50V Cerm	900010-38	.06
CR1-CR16	IN4003 Diode	900750-03	.11
CR17-CR26	IN4148 Diode	900850-01	.05
L1	100MH RF Choke	901301-01	2.30
L2,L5	150MH RF Choke	901301-02	1.30
L3,L4	680MH RF Choke	901301-03	1.18
P6	5 Pin Header (Power)	903302-02	.40
P7	20 Pin Header	903311-01	1.60
P9,P10	4 Pin Header (Read/Write Head)	903315-01	.98
Q1,Q2,Q5,Q6	2N4403	902704-010	.18
Q3,Q4,Q7-Q10	2N4401	902652-01	.15
R1-R4,R27	1K ohm $\frac{1}{2}$ W	901550-01	.05
R5-R12	680 ohm $\frac{1}{2}$ W	901550-31	.05
R13,R19,R20,R28,			
R31,R38	20K ohm $\frac{1}{2}$ W	901550-92	.05
R14,R23,R47	2K ohm $\frac{1}{2}$ W	901550-53	.05
R15	272 ohm $\frac{1}{2}$ W 1%	901751-10	.17
R16	909 ohm $\frac{1}{2}$ W 1%	901751-13	.17
R17	750 ohm $\frac{1}{2}$ W 1%	901751-09	.17
R18,R25	2.26K ohm $\frac{1}{2}$ W 1%	901751-14	.17
R21	300 ohm $\frac{1}{2}$ W	901550-70	.05
R22	100 ohm $\frac{1}{2}$ W	901550-49	.05
R24	604 ohm $\frac{1}{2}$ W 1%	901751-11	.17
R26	510 ohm $\frac{1}{2}$ W	901550-38	.05
R30,R37	845 ohm $\frac{1}{2}$ W 1%	901751-12	.17
R32,R40	3K ohm $\frac{1}{2}$ W	901550-33	.05
R33,R41-R45	9.09K ohm $\frac{1}{2}$ W 1%	901751-15	.17
R36	75 $\Omega$ ohm $\frac{1}{2}$ W	901550-45	.05
R39	68 $\Omega$ ohm $\frac{1}{2}$ W	901550-94	.05
R46	75K ohm $\frac{1}{2}$ W	901550-86	.05
RP1,RP2	330 ohm Resistor Pack	902422-01	.75
RP3	680 ohm Resistor Pack	902422-02	.75
UA2	9602 One Shot	901510-01	.80
UA3	7486 Exclusiv or Gate	901522-18	.50
UA4	LM 311 Voltage Comparator	901523-04	.90
UA5	LM 592 OP-AMP	901523-08	2.35
UB1,UD1	7406 Hex Inv. Buffer	901522-06	.40
UB2,UC1	74LS04 Hex Inv.	901521-02	.35
UB3	74LS74 Flip-Flop	901521-06	.50
UC3	Q2T2905 Transistor Pack	902551-01	1.96
UC5	Q2T2222 Transistor Pack	902550-01	1.96

APPENDIX

D

SA 390

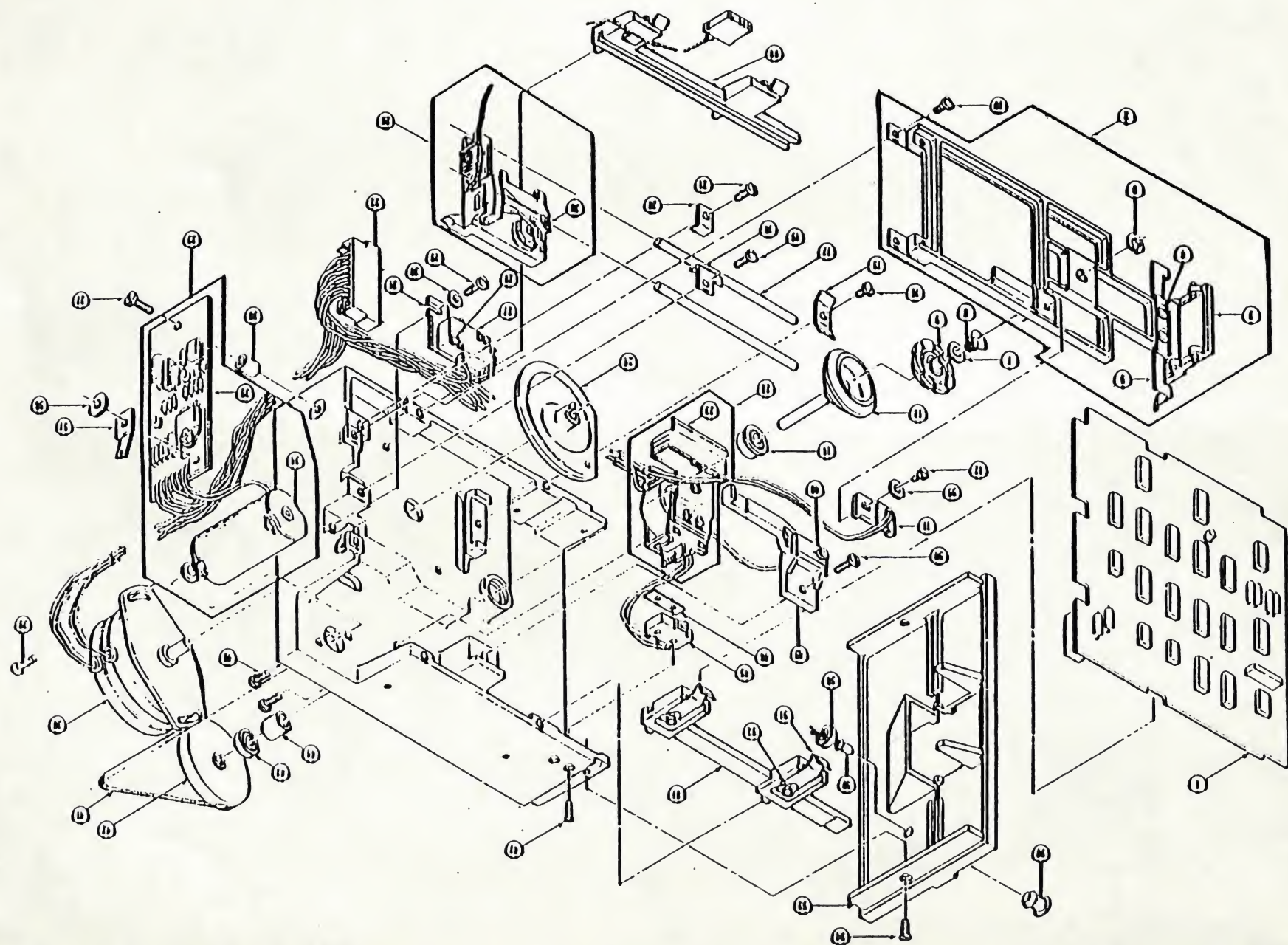
PARTS REFERENCE



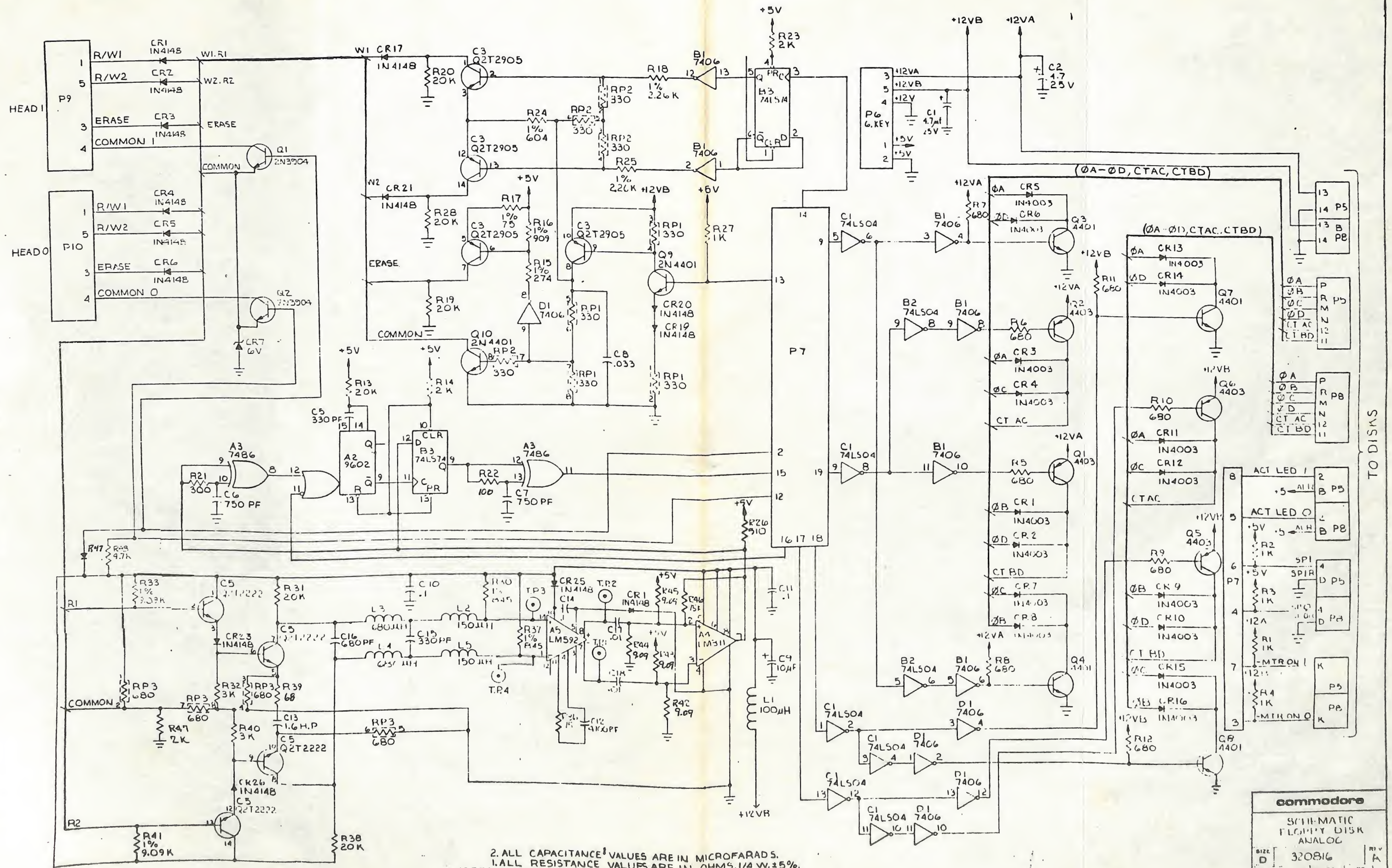
# SPARE PARTS PRICE LIST FOR SHUGART 390 DRIVE

<u>REF. NUMBER</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
47	10166-0	Screw 2/56X.500	.50
19,16,10,4	10186-0	SCW#6-32X.19 T10159	.50
39,12,29	10187-0	SCW#6-32X.25 T10159	.50
50	10189-0	SCW BH 6-32X.375 T1	.50
37	10191-0	SCW#6-32X.50 T10159	.50
43	*10804-0	Bearing, Ball	4.50
14	*10805-0	Bearing, Ball	5.00
6	11305-0	Ring Retaining	.50
58	11312-0	Fastener, LED	1.00
54	11900-0	Screw 6/32X.250	.50
56	12501-0	Lock Wahser #6 T12502	.50
57	15663-0	Tab, Fasion	.50
59	15915-0	LED, Red	1.50
45	17212-0	Switch Write Protect	3.00
35	25063-0	Drive Mtr Speed Control AM	22.00
24	54003-1	Cam-Actuator	.50
17	54006-0	Rod, Guide	1.50
13	*54032-0	Spindle-Machined	27.00
31	54038-0	Plate Trk 0	1.00
34	54047-0	Drive Motor	28.50
41	54048-0	Belt, Drive	5.00
25	54055-0	Carriage Head ASM	91.50
5	54057-0	Stop, Diskette	.50
46	54062-0	Plate Nut	.50
9	54066-1	Hub Clamp ASM	6.50
33	54067-0	Drive Motor ASM	45.00
38	*54068-0	Step Motor ASM	27.00
2	54070-0	Hub Frame ASM	39.50
3	54073-0	Door Hinge ASM	2.00
53	54077-2	Cover, Front	2.50
1,520	54078-0	Keeper, Guide Rod	.50
60	*54089-0	Guide Disk ASM Right Side	1.50
61	*54090-0	Guide Disk ASM Left Side	1.50
44	*54097-0	Spacer, Long	1.00
18	54099-0	Clamp, Guide Rod	.50
49	54125-0	Platen, Machined Complete	1.50
7	54131-0	Collar Hub	.50
8	54132-1	Spring, Clamp	.50
42	*54138-0	Pulley ASM	22.00
26	54145-0	Load Button ASM	1.50
1	320817-01	Analog Board	45.00

\* Not Field Replaceable

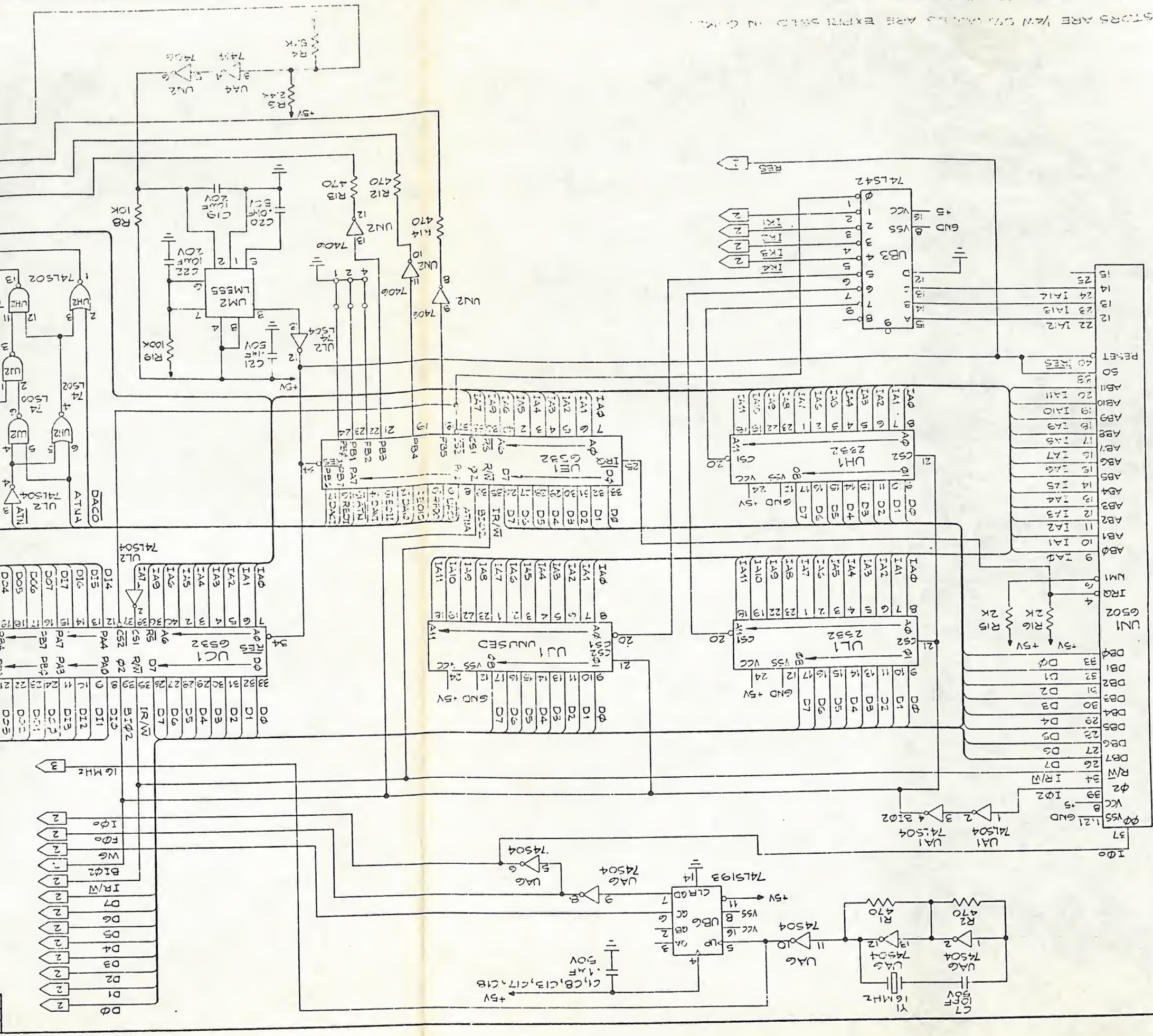
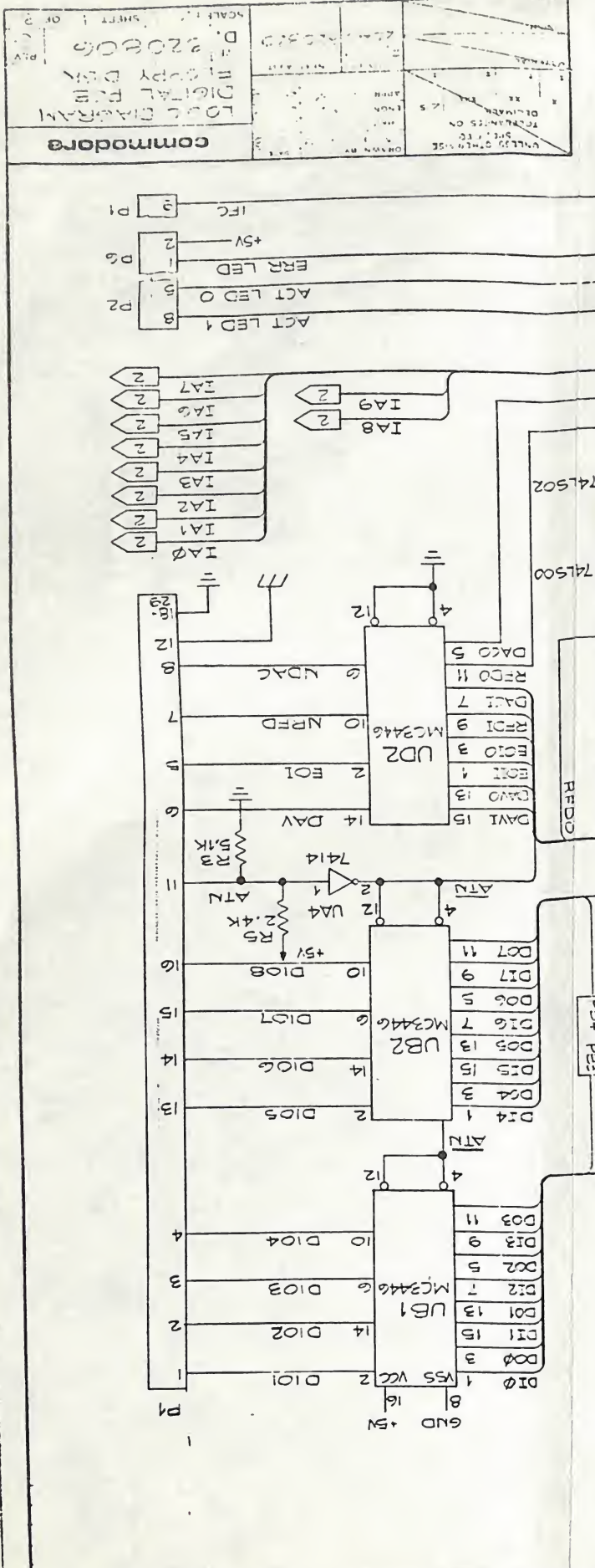








REV	DATE	DESCRIPTION
1	11/10/83	REV FOR DRAWING PER ECO 1623
2		DATE APPROVED



1. RESISTORS ARE 1/4W 5% UNLESS OTHERWISE SPECIFIED.  
 NOTES - UNLESS OTHERWISE SPECIFIED

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LOGIC DIAGRAM

DATE

11/10/83

DESCRIPTION

REV FOR DRAWING PER ECO 1623

SCALE

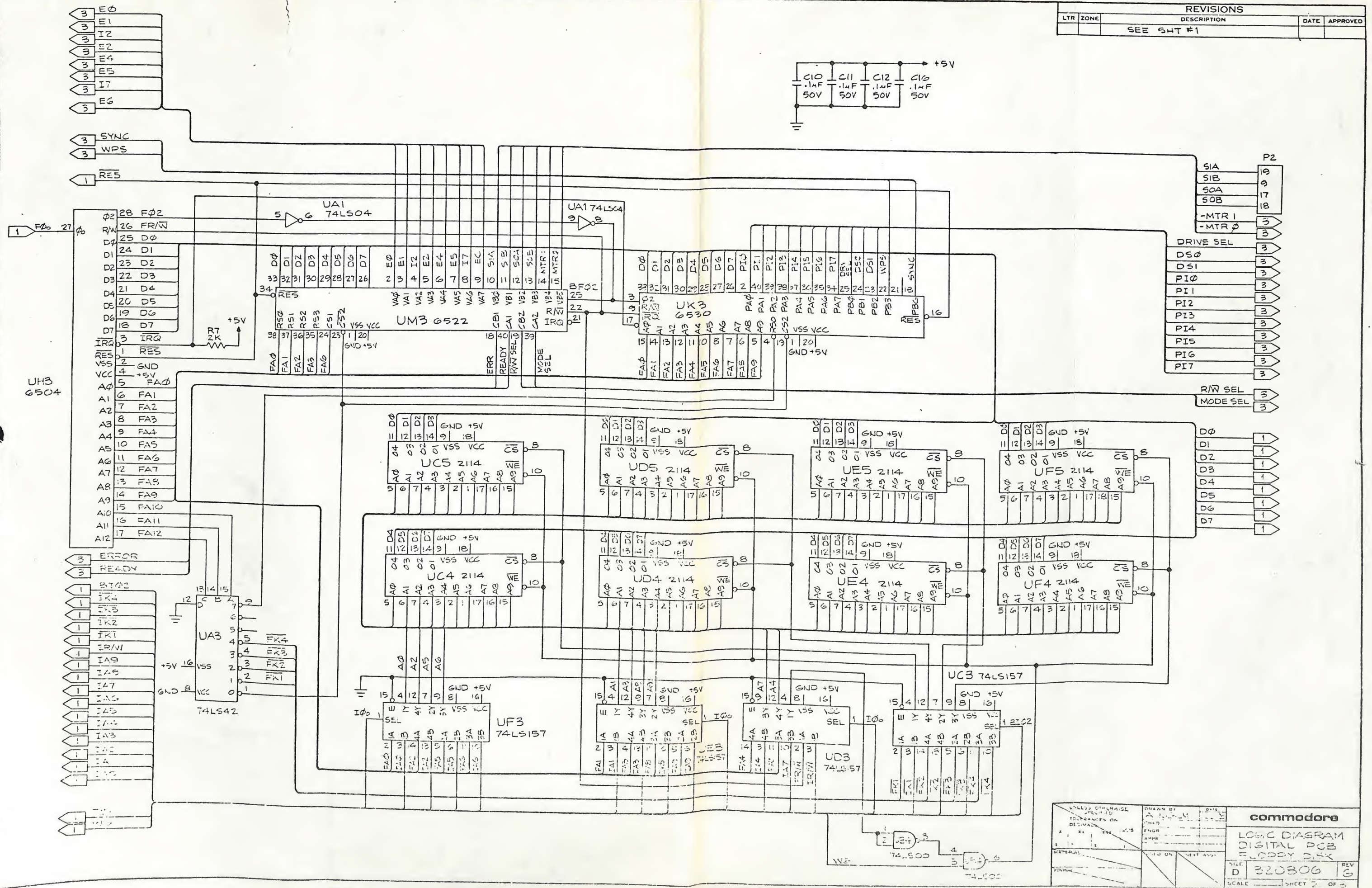
1:1

SHEET

1 OF 2

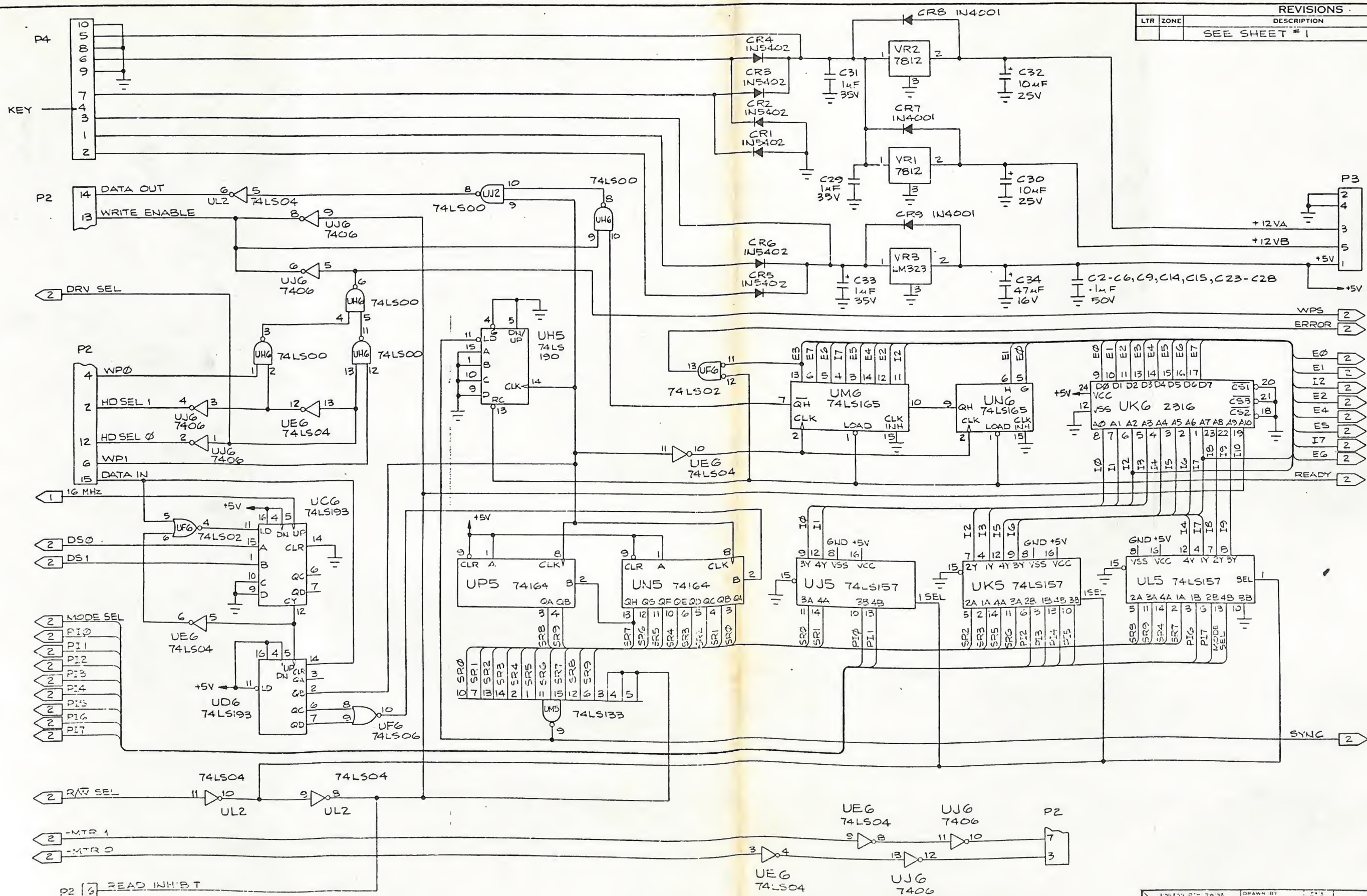


REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHT #1		





REVISIONS			
LTR	ZONE	DESCRIPTION	DATE
SEE SHEET #1			
APPROVED			



UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES.		DRAWN BY: A. J. M. / 1/77	
MATERIAL: 1/16" ALUMINUM		ENGR: J. M. / 1/77	
FIG. NO. 100-100000		REV. 1	
SCALE: 1" = 1"		SHEET 3 OF 3	

commodore

LOGIC DIAGRAM  
DIGITAL PCB  
FLOPPY DISK

SIZE: D 320806

SCALE: 1" = 1" SHEET 3 OF 3